Extension of Coronal Structure into interplanetary Space

R. Woo (Jet Propulsion Laboratory, California institute of Technology, Pasadena, CA 91 109; tel. 818-354-3945; c-mail: richard@oberon.jpl.nasa.gov)
S. R. Habbal (Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138; tel. 617-495-7348; e-mail: shabbal@cfa.harvard.edu)

The evolution of the solar corona and its imprint on the solar wind is investigated by comparing Ulysses radio occultation measurements of path-integrated electron density and density fluctuations in the heliocentric distance range of 21-32 R. with simultaneous measurements of the solar corona by the HAO Mauna Loa K-coronameter. This comparison is made during the 1995 Ulysses solar conjunction, which is ideally suited for sampling the raylike structures revealed in previous radio occultation measurements, since the relative motion of the Ulysses radio path is mainly in a direction transverse to the coronal structures.

The most striking features resulting from these measurements include: (1) the approximate preservation of coronal structures observed in the white-light measurements as they extend into interplanetary space, the exception being the narrowing of streamers to stalks prior to their eventual radial expansion, and (2)the extension of plumes in polar coronal holes to 30 R. with their signatures apparently found everywhere in the corona including streamers. The emerging picture of the outer corona is one in which stalks of streamers, occupying a small fraction of volume in interplanetary space, are superimposed on a background corona distinguished by a plethora of raylike structures. All raylike structures, except for the stalks of streamers, seem to be the source of the fast solar wind. The radial preservation of the boundary between the polar coronal hole and streamer, along with the radial expansion of all structures, including the finest in polar coronal holes, implies that the polar wind does not undergo any significant expansion, as previously thought.